three to a millimeter, at first concentric but about the anterior third of the valve becoming oblique, and becoming obsolete near the posterior third; beaks inconspicuous; interior chalky white, the muscular impressions subequal, the pallial sinus rounded, in front, mostly free from the pallial line and falling a little short of the anterior adductor scar; the ligament is short and the margins smooth. Length 35; height 23; diameter 8; the vertical from the beaks behind the anterior end 17 mm· U. S. Nat. Mus. Cat. No. 333023.

Ampullaria (Felipponea) elongata n. sp.

Shell solid, conic, of three and a half flattish whorls separated by a distinct, almost channelled suture (the apex deeply eroded); shell substance grayish to slate color, with irregular broad spiral purple lines, the whole covered with an olivaceous, thick, polished, dehiscent periostracum of a brittle character; base rounded, umbilicus only a narrow chink behind the thin raised inner lip; aperture pear-shaped, smooth inside, showing the color bands; margin sharp-edged, not continuous across the body. Height of decollate shell 29; of last whorl 25; of aperture 17; of maximum diameter 19 mm. U. S. Nat. Mus. No. 333024.

Habitat. Uruguay River, Dept. of Paysandú; Dr. F. Felippone.

It is interesting to get another and quite distinct species of this subgenus which seems characteristic of Uruguay River fauna. The present species differs most obviously from the type, *F. neritiniformis*, in the flat-sided spire and absence of an umbilicus.

THE GENUS PLEBECULA LOWE.

BY T. D. A. COCKERELL.

At the fossil-beds near Caniçal, Madeira, the large globular shells of *Plebecula bowditchiana* (Fér.) occur in hundreds of thousands weathered out of the fine sand. In Porto Santo we find similar deposits, but nearly all the species are different, in

spite of the fact that the mountains of the smaller island are plainly visible from the vicinity of Caniçal. Between Porto Santo and Madeira is deep sea, and it is evident that the islands could not have been united within the life-time of existing species of snails. Nevertheless, among the scant half-dozen forms common to the Caniçal and Porto Santo deposits is *P. bowditchiana*, one which would seem among the least likely to be accidentally transported across the sea. It is a heavy white shell, resembling in a general way the well-known *Leucochroa candidissima* of the Mediterranean basin. The vast quantities at Caniçal suggest at first a former climate very different from that of today, but the snail was doubtless adapted to arid or semiarid conditions, such as prevail now at the eastern end of Madeira. The sandy wastes of the locality swarm with living snails at the present time, but they are with inconspicuous exceptions *Helix pisana*, probably introduced long ago from Africa by the Moors. The *P. bowditchiana*, however, would need more cover than exists now, as they were nocturnal, hiding by day, if we may judge by the habits of their living relatives. I have carefully compared the Madeira and Porto Santo *P. bowditchiana*, thinking that some differences might be found, but they are unquestionably identical. There is, however, this difference; the Porto Santo specimens show a much wider range of variation. This may be taken to indicate that the species evolved on Porto Santo, and the one or more examples which somehow reached Madeira started a colony which remained essentially true to the type represented by the immigrants. Twenty *P. bowditchiana* from Porto Santo varied as follows in dimensions, the first figure of each pair being the length, the second the diameter at right angles to the axis, both in mm. 15.18 (1), 15.20 (1), 16.20 (2), 17.19 (1), 18.21 (2), 20.22 (1), 21.22 (2), 21.23 (1), 22.22 (1), 22.24 (2), 23.23 (3), 24.27 (1), 25.24 (1), 25.25 (1). The shell having a length less than 18 mm. (obtained in the vicinity of the Fonte d'Areia) constitute a distinct form or variety, which may be named *reducta*. They are not only small, but differing from the related small *P. punctulata*, they are broadened, with a strongly and evenly arched outer lip, so that the whole shape is very like that of

Helix hortensis. The one I take as typical of the variety measures 16 by 20 mm., and the apex, with curved rows of granules, is delicately tinted with orange, giving the shell a more recent appearance than usual. This may be the latest phase of *bowditchiana*, but its resemblance in form to more ordinary snails might be taken to indicate greater antiquity. I was not able to make out distinct zones in the Porto Santo fossil beds, although some species abound in one place, and are rare or absent elsewhere. The sandy deposits are broken down by the weather, and the shells loosened upon the surface. Many of these are again covered, as the wind blows the sand, and the lime again cements the deposit, so that it is quite possible to find shells of entirely different ages mixed together. In fact the very modern *H. pisana* is being thus incorporated, and no doubt in years to come it will be possible to dig *pisana* and *bowditchiana* out of the same fossil-beds, just as if they had been strictly contemporaneous.

In order to show the greater uniformity in the Caniçal P. *bowditchiana*, I give the measurements of 156 shells, citing the two dimensions as before. 18.19 (1), 18.21 (1), 19.20 (2), 19.21 (7), 20.20 (6), 20.21 (18), 20.22 (8), 21.21 (9), 21.22 (22), 21.23 (7), 21.24 (3), 22.21 (1), 22.22 (12), 22.23 (28), 22.24 (2), 23.22 (1), 23.23 (5), 23.24 (13), 23.25 (1), 24.22 (1), 24.24 (2), 24.25 (4), 26.25 (1).

The nearest living relative of *P. bowditchiana* is *P. punctulata* (Sowerby), exceedingly common on Porto Santo, and found also on the outlying islets, even the isolated Ilheo de Nordeste. It hides under rocks, more or less buried in the ground, and I never saw it crawling abroad. A remarkable feature is the opaque white mantle, which, when the animal is within the shell, looks at first sight like a dense white epiphragm. The genitalia show a very long slender flagellum. The living animal may be described as follows: Animal whitish translucent; tentacles and neck above dark grey, nearly black; foot very broad, caudal end very broad and flat; a large black mark on each side posterior to tentacles; mantle opaque white (specimen from Villa Baleira). The shells vary much in color, some being very dark. Two bands, never seen in *bowditchiana*, are

nearly always present, but on the Ilheo de Baixo, on Jan. 22, I found a creamy-white bandless variety, which may be called var. *lactescens.* This form was also known to Wollaston. The distribution of *H. punctulata* is peculiar. It has not been recorded from Madeira, but a rather small and peculiar race (*avellana Lowe*) occurs both living and fossil on Bugio, the southernmost of the Desertas. At the fossil-beds near Caniçal, Madeira, however, I found a specimen of undoubted *P. punctulata*, measuring 13 by 14 mm., thinner than *bowditchiana*, and still showing faint traces of the bands. It has a recent appearance, and may not be truly fossil. Whether *P. punctulata* really lived in Madeira, may still remain somewhat uncertain, as Baring and Ogilvie Grant (Zoologist, Nov. 1895) report finding seven whole *H. pisana* in the stomach of a kestrel, and it is conceivable that an owl pellet might contain an unbroken snail shell.

The *P. punctulata* in Porto Santo suffer severely from an enemy, the broken shells being found very commonly under rocks. From the position of these remains, it was impossible that the enemy should be a bird, and the small lizards (*Lacerta dugesii*) so common under the rocks probably could not break the shells. Baring and Ogilvie Grant (loc. cit.) speak of the great spider of Porto Santo (*Lycosa madeirana* Walck.) as feeding on snails, and I have no doubt that this is the mysterious enemy of *P. punctulata.* In the face of such an enemy, *P. bowditchiana*, with its large and thick shell, would have a great advantage over its smaller relative.

The common *P. vulgata* (Lowe) of Madeira has the same white mantle, and is evidently strictly congeneric. According to Pilsbry this is the real *nitidiuscula* of Sowerby, though not that of Wollaston. The soft parts of *vulgata* from Funchal were described as follows :

Animal with foot broad, white ; tentacles black ; dorsal side of head and neck very dark, abruptly contrasting with the white foot ; mantle opaque white. The habits of *vulgata* seem to be much like those of *punctulata*, though it is perhaps less retiring. There is a large *Lycosa* (*L. blackwallii* Johnson) in Madeira, which may prey upon it but it seems to be absent from the lowlands about Funchal, where *P. vulgata* abounds.